Heesu Kim et al., Chem Sci J 2018, Volume 9
DOI: 10.4172/2150-3494-C2-021

Polyaniline derivative-modified microelectrodes for the detection of carbon monoxide in the mouse kidney

Heesu Kim, Kyong-Hoon Choi, Bong Joo Park and **Jae Ho Shin**
Kwangwoon University, Republic of Korea

Carbon monoxide (CO) which is naturally produced by the action of heme oxygenase in the human body plays diverse physiological roles as a signaling molecule. Abnormalities in its metabolism have been linked to a variety of diseases, including hypertension, neurodegeneration, heart failure, and inflammation. Therefore, the reliable detection of CO is essential to elucidate its numerous biological functions. However, the electrochemical measurement of CO has been challenging due to its low concentration, rapid diffusion, and severe interference from other electrochemically active species (e.g., nitric oxide, nitrite, ascorbic acid, and uric acid). The elimination of NO interference in the CO sensor development is one of the important factors, because NO's biological functions are closely related to CO's ones. Herein we report on a novel amperometric CO sensor with superior sensitivity and selectivity (especially over NO) *via* use of aniline derivatives as a sensing membrane. The film of aniline or its derivatives is deposited on a Pt electrode by electropolymerization (i.e., cyclic voltammetry). The sensing mechanism and the effect of electropolymerization conditions (e.g., scan rate, number of scan cycles, and types of anions doped during polymerization) will be discussed. A series of aniline derivatives ortho, meta, and para-substituted with electron donating (e.g., methyl and ethyl) and electron withdrawing (e.g., fluoro, chloro, bromo, carboxylic, trifluoromethyl, and sulfonic) groups are employed to evaluate the substitution effect on sensor performance (e.g., sensitivity, selectivity, and stability). Finally, to evaluate biological utilities of the sensor, CO generated from the mouse kidney during ischemic injury will be determined.

Biography

Heesu Kim received her B S degree in department of chemistry at Kwangwoon University in 2017. Currently, she is studying for her M S degree in chemistry at the same university. Her research interest is mainly in the development of electrochemical microsensors for the detection of carbon monoxide and nitric oxide in the biological milieu.

heesu9292@naver.com

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